Ecuador’s northern coastal plain is the epicenter of rapid deforestation in Ecuador. Over the last few decades, the rich coastal rainforests have been reduced to less than 10% of their original range, and they continue to diminish due to the rapid expansion of the agriculture frontier. The primary causes of deforestation are settlement by colonists who clear forests for small-scale agriculture and the rapid growth of industrial oil palm and cacao plantations, that clear large blocks of native forest each year.

The Chocó forest region, which is restricted to the coastal plain in northern Ecuador and southern Colombia, supports one of the most diverse plant communities in the world, with 20% of the plant species found only in this forest region. Most of the remaining forests, whether inside or outside of designated reserves, are inhabited by poor indigenous and colonist communities, like Cristobal Colon, which are dependent on forest resources for their subsistence living.

The conservation strategy of EcoMadera is based on establishing an economic incentive for conserving forests by making sustainable forest management financially competitive with agriculture. To accomplish this, EcoMadera is evolving as a rapidly growing forest products company that practices sustainable forest management and produces wood products for export markets. By creating many new community jobs and providing families with a market for sustainably produced timber, EcoMadera is creating an economic alternative to pervasive forest exploitation. The goal is to build an enduring community enterprise which manages large areas of the landscape in a system of small reserves, managed native forests, forest plantations, and forest restoration projects. In order to provide this alternative, EcoMadera, like any new business, must become a well-run and profitable venture so it can attract investors and talented professionals and can provide new sources of local employment.

But the challenges are great: EcoMadera works in the midst of well-organized market forces that support forest exploitation. The watershed where the business operates is largely outside the rule of law. The forests are extremely diverse and poorly understood, and most of the timber species have poor markets. No conventional business in Ecuador has attempted to

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This issue of The Pinchot Letter highlights several important aspects of the Institute’s EcoMadera community forestry project in Cristobal Colón, located in the rainforests of northwestern Ecuador. The single most important factor in the success of this effort has been the extraordinary leadership and commitment of Peter Pinchot and his team of researchers. Peter has been able to create a new and highly successful model for sustainable forestry in the tropics, where so many others before him have failed. When Peter came to Cristobal Colón a decade ago, it was a typical impoverished rural community, caught in a cycle of economic exploitation, which was itself based on overexploiting the local forest. This local forest serves as a key buffer for the nearby Cotacachi Cayapas Reserve, yet it was already on a predictable trajectory toward conversion to oil palm plantations and a loss of local land rights.

Through Peter’s vision and sustained commitment in spite of numerous challenges and obstacles, local land tenure rights now have the force of law, the surrounding forest and its extraordinary biodiversity are being sustained, and economic conditions for the local community are the best they have ever been. The locally-owned wood products enterprise, which is based on planting and sustainably harvesting native species, is the community’s single largest generator of local income and employment. For the first time in its history, the community has a local health clinic, which was made possible by the EcoMadera project and by the generous support of Pinchot Institute board members. This in turn has made it possible for the Ecuadorian government to assign health care professionals to the community. Not only does this provide for urgent care in case of accidents, but now for the first time there are local opportunities for improved pre-natal care and treatment of chronic illnesses — neither of which were possible when the nearest doctor was a two-hour bus ride away.

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A century ago when the U.S. was still a developing nation, Gifford Pinchot asserted that forest conservation would be successful in the long term only where it was proven to be environmentally sound, economically viable, and socially responsible. As we are approaching the International Year of the Forest in 2011, the EcoMadera project is showing that this conservation philosophy applies in other developing nations as well, and demonstrating that sustainable forest management can be an environmental, economic, and social asset even to struggling rural communities in tropical forests. This is why it works. And it can work elsewhere. The Pinchot Institute — with the support of key partners like the MacArthur Foundation, the Overbrook Foundation, the Switzer Foundation, and the World Land Trust — is committed to seeing the EcoMadera effort through to where there is no question that it can be self-sustaining, before turning its attention to replicating this model in other tropical forest communities. Yet the attention EcoMadera is attracting is steadily increasing its value as a learning tool for others who will take these lessons and apply them in other forests and other communities. Many thanks to Peter and his team, and to our many faithful and persevering partners in this important research and demonstration project.

— Al Sample

Demonstrating Sustainable Community Forestry in Ecuador

(continued from page 1)

address the challenges of deforestation in Ecuador’s coastal plain. And with no economic incentives to work with, conservation NGOs have had very limited success in reversing deforestation. Both approaches are necessary concurrently. Consequently, EcoMadera has evolved as a hybrid social venture, part non-profit conservation project and part for-profit business enterprise.

The EcoMadera Business Enterprise

EcoMadera began in 2004 as a 100% community-owned wood products business with technical assistance support provided by two NGOs — the Pinchot Institute for Conservation and our Ecuadorian partner, Fundación Jatun Sacha. Funding for business infrastructure and working capital was provided largely by the founding investor, Peter Pinchot. By 2007, it had become clear to Pinchot, to the community shareholders, and to the NGO professionals that the existing community forestry business structure would not lead to a profitable venture that could meet the commonly held goals of conservation and community economic development. It lacked the business leadership skills, capital, and experience necessary to launch a competitive wood products business. What was needed was a more conventional business structure with entrepreneurial leadership that could command the resources and innovation necessary to reach profitability and continued growth. Furthermore, the existing community ownership structure specifically precluded outside investors, which was critical to accessing capital in order to expand.

To address these needs, the community shareholders agreed to enter into a new business structure, which would provide much greater potential for business success and for achieving...
the community goals. In spring of 2008, a new US corporation, Eco-Madera Forest Conservation, LLC was founded, and a new Ecuadorian company, Verdecanandé, SA, was established as a full subsidiary of the US LLC.

EcoMadera is still a community-focused business under this new structure, with the goals of forest conservation and community economic development. However, it is now led by two American entrepreneurs (Peter Pinchot and Garrett Seigers), it is managed by Ecuadorian professionals (including two community members), and is funded by outside investors. The original community forestry enterprise now acts as a stakeholder with a strong voice in major business and conservation decisions. The result is that EcoMadera is now constituted as an American social venture company, with the capacity to grow rapidly through access to capital, to address the complexity of demanding markets through professional management, and required to work closely with community leadership through continued local ownership.

**Finding the right wood products for EcoMadera**

From 2004 to 2007 EcoMadera tried to establish a business producing and selling hardwood millwork products to Ecuadorian markets. EcoMadera sold dimensional lumber to secondary manufacturers and floor-ing, doors, and cabinets to housing contractors. However, several factors made this venture unprofitable. There are well over 300 tree species in the watershed where EcoMadera operates, and very few are abundant.

In 2007, EcoMadera developed a strategy for utilizing many species by combining them into three-layered engineered flooring. The business produced samples, sent them to the US, and made a preliminary market tests demonstrated significant interest from housing contractors in Pennsylvania and New York City. Although a feasibility study suggested that it could be a profitable venture, it would require over $1 million in financing to launch such a business.

EcoMadera decided to shift to an alternative, balsa wood laminates, as its first high-volume product. Balsa laminate production has several strong advantages. 1) It is a globally well-known species; 2) there is a large market of industrial uses that exists in every continent; 3) Ecuador is the world leader in production of balsa laminates; 4) the production technology is well-known and relatively simple; 5) the processing infrastructure is relatively inexpensive; and 6) the market is expanding, especially in China and India, where wind energy production (which uses balsa laminates) is growing very rapidly.

By refocusing its production on the balsa laminate market, EcoMadera would be able to establish a profitable business foundation that could demonstrate the basic business skills of cash flow management, managing employees, serving the needs of customers, keeping good financial records, paying taxes, working with investors, and servicing loans.

**Gearing up for balsa laminate production:** In 2008, EcoMadera began to upgrade its hardwood millwork facility to function as a manufacturing plant for balsa wood laminates. The original wood products plant had been built in 2003 as a US Peace Corps project, with limited funds and limited technical expertise. Every element of the plant had to be updated or replaced. A consultant designed several new pieces of equipment including a kiln furnace, a sawdust extraction system, and a block press. EcoMadera built new pre-dryers and made major improvements to the kiln, expanded the original production shop, made new roads for a fork-lift, imported Taiwanese and Brazilian wood-processing machinery, and installed a large diesel generator.

In January, 2009, EcoMadera began producing and selling balsa blocks to its first client, Balsaflex, a Spanish balsa laminate maker with a factory in Ecuador. The largest market for balsa wood is in the production of industrial composites that use balsa laminates as the core material in its sandwich structure. Balsa wood is in high demand because it is very light, yet very strong for its weight, due to a natural honeycomb cellular structure.
The strongest market now is the production of wind turbine blades, where its lightweight and strength make it the preferred material for the thinnest part of the blades, where strength is essential. Due to the very rapid growth of wind turbines, especially in China, demand for balsa laminates did not decline heavily in 2008, and by mid 2009 had recovered fully.

EcoMadera buys balsa in logs or in cants from small sawmill operators throughout much of the coastal plain, which are sawn into different dimensions in the plant in Cristobal Colon. They are then dried in the kiln, dimensioned with saws, planers, and jointers, and finally glued together in large blocks. These blocks are sold to Balsafilex, who then cuts the blocks across the grain with a bandsaw to produce end-grain laminates. These are exported to North America, Europe, and Asia. EcoMadera now has a stable client who wants all the balsa blocks that EcoMadera can provide. Thus EcoMadera’s entrepreneurs have begun learning the most important fundamental of any business, how to manage cash flow, the lifeblood of any business, on a weekly and monthly basis. But by 2009, it became apparent that EcoMadera’s production was severely limited by its kiln capacity. Despite a strong demand from the client, EcoMadera’s average monthly production of balsa blocks was limited to about 20,000 to 25,000 board feet, which was well below the break-even point of the business.

Raising capital to expand the production facility: In order to become a profitable business venture, EcoMadera needed to raise a significant amount of capital to expand the balsa plant. In 2009, Peter and Garrett visited several balsa block facilities, talked extensively with the manager of Balsafilex about how to design better kilns and a more efficient plant, and developed cash flow models to understand how large the business needed to become in order to be viable. The new business plan called for a balsa plant that could reach five times its current production.

Just as EcoMadera set out to raise several hundred thousand dollars in loans or equity investment, the market crashed, and risk aversion became the watchword of creditors and investors. Throughout 2009, Peter Pinchot, as the entrepreneur, talked to banks, Program-Related-Investment (PRI) programs at foundations, social investor organizations, including Root Capital and the Calvert Foundation, international loan organizations such as the Overseas Private Investment Corporation (OPIC), and to several private equity investors. The key obstacles EcoMadera faced was that 1) the business had never produced a profit, 2) it was operating in a poor, developing nation with a high-risk profile, 3) it had an untested business management team, and 4) with a strong social mission, the business could not project high enough returns on investment to appeal to many private equity investors. However, in March of 2010, with support from close family members, EcoMadera was able to secure two private loans totaling $450,000. This investment allowed the business to start its Phase Two construction.

The plant, which includes a large steam boiler, three new kilns, a sawdust extraction system, a much larger shop facility, and high-volume production machinery, can produce 125,000 board feet of product per month, 5 times the 2009 production. As this new equipment becomes operational, it is expected that by November, the business will have generated sufficient revenues to reach profitability. After seven years of uncertainty, it is now becoming clear that the business will survive, and more than that, is poised to grow rapidly and profitably.

In 2004, EcoMadera employed 12 local technicians, most of whom were running chainsaws and working in the illegal timber supply chain before they were hired. EcoMadera now employs 29 people, and by 2011, we expect to have roughly 50 full-time employees in a watershed of 250 families. The key is that EcoMadera is providing employment to families that are desperately in need of income to meet their subsistence needs. These are people who will no
longer be cutting illegal wood from the forests for their livelihood. This is the beginning of the establishment of an alternative local economy based on conserving and restoring forests, rather than clearing them for agriculture.

The *EcoMadera Conservation Project*: The *Pinchot Institute* as NGO partner in a hybrid social venture

In order to make the transition from forest exploitation to an ecologically sustainable management of forests, which supports a forest products industry and also benefits communities, *EcoMadera* must carry out basic research on forest ecosystems, wood technology, wood products, and environmental services. This research, and the innovations which result, have the potential to link well-managed forests to profitable wood products markets. The problem is that in Ecuador, as in many developing nations, basic knowledge about forests and wood products is very scarce. This poses a fundamental structural barrier to the development of sustainable supply chains that provide an economic incentive for conserving forests.

Compare this to the North American experience of the late 1800’s. At that time, the United States was at the peak of its own period of forest exploitation. However, by the first decade of the 1900’s, land grant colleges, private universities, and the USDA Forest Service had started programs of basic research in forest taxonomy, silviculture, forest ecology, and wood technology. The US Forest Service, state forestry agencies, and the emerging forest products industry began to implement this evolving scientific understanding by innovating new ways to market and manage their forests more efficiently. Businessmen like Fredrick Weyerhaeuser had practiced destructive logging for decades but were now beginning to see that these new practices, based on long-term management of forests and developing valuable wood products, were more profitable over the long term. One such innovation was the production of standard dimensional lumber that could be utilized in the new building technique of balloon frame construction. Through a series of these kinds of innovations in forest management, wood products, and marketing and distribution supply chains, forests became sufficiently valuable as suppliers of resources to justify (for some) the transition to sustainable management. New rural industries in forestry and wood products emerged, which gradually became the dominant economic forces and major employers in many rural regions.

In countries without this kind of basic forestry and wood product research, the innovations for the evolution of sustainable forestry are not possible without outside assistance. Thus the *Pinchot Institute’s* fundamental role with *EcoMadera* is to support basic studies of forests species, wood products, environmental services, and innovations in sustainable forest management, that have the potential to link forests to strong market demand.
Balsa Plantation Trial: EcoMadera’s balsa plant is located in a heavily forested watershed where balsa is not very abundant and exists largely in riparian zones and abandoned farm-land. In order to compete economically, EcoMadera’s balsa business must have access to a local supply of balsa trees. Balsa is a pioneer species, which regenerates naturally in zones of significant disturbance. However, balsa plantations have rarely been established in zones with such high rainfall, nutrient deficient soils, and abundant pastureland, as exist in the watershed.

In late 2008, the Pinchot Institute established a program of balsa plantation trials, utilizing 20 hectares on land owned by EcoMadera and 10 hectares on land owned by several community members. Darwin Rosero, EcoMadera staff botanist, established balsa tree nurseries and started trial plantations in several kinds of sites. These included the conditions most commonly available in the watershed: abandoned cattle pasture, former cropland, and early stage secondary growth. 18 months later, we were surprised to see that balsa plantations established directly in degraded pasture grew much better than expected. In many cases, the plantations grew poorly for the first six to eight months, but then after nine or ten months, they began to grow rapidly. Based on the positive results from the plantation trials, EcoMadera is preparing to raise significant venture capital to establish a balsa plantation program. EcoMadera’s current goal is to expand production to 250,000 board feet of balsa blocks per month (a $3 million per year business).

Based on this target and on the yield predictions from our plantation trials, EcoMadera should manage about 800 hectares of plantations, divided into six age classes. (Balsa plantations are usually harvested in their fifth and sixth year). Thus each year we would need to plant 130 hectares, and in the fifth year we would harvest our first crop. This program is projected to employ 15 to 20 local technicians the first year, and by the 5th and 6th year, with 800 hectares in plantations, it should require 35 to 40 local technicians.

EcoMadera will establish 70 hectares of plantations per year on EcoMadera’s own land, and 60 hectares a year on plantations established by local families on their land. Working with families to manage plantations will provide them a new source of income. We will support plantations only on land that has already been cleared for other purposes. The business will pay families a large portion of their labor and all the materials needed to plant and manage their plantations. EcoMadera will also provide intensive training, monitoring, and technical assistance as needed. At the harvest, the business and the families will share the revenues. Based on this plan, EcoMadera is now talking to investors to raise $500,000 to establish and manage balsa plantations. We project that investors should be able to realize a 10 to 14% annualized return on their investment, taking risks into account.

Secondary/degraded forest restoration study: Roughly 20% of the Río Canandé watershed where Eco-Madera operates has been cleared and another 20% has been heavily exploited or is in early stage secondary forest. Consequently, one of Eco-Madera’s priorities lies in determining how to accelerate the recovery of forest diversity and ecological function in these areas. To address this challenge, the Institute hired Dr. Amy Rogers, a forest research ecologist, in 2008. Amy’s doctoral research focused on developing an innovative new strategy for restoration in tropical secondary forests, based on using nature itself as an instructive model. Along with a team of twenty-some field assistants, she tested the five factors most commonly cited as predominant obstacles to early stage (i.e., pre-canopy) tropical forest regeneration, both by themselves and in every possible combination. The result was nothing short of astonishing. Despite preconceptions and decades of theories about soil fertility, weedy understory competition, distance to seed sources, and predation by animals as fundamental limiting factors in the recovery of secondary forests, Amy’s results revealed that the true cause of failed primary forest seedling establishment is simply a lack of dispersal. Seeds of the majority of species that were tossed onto the forest floor within test plots (in combinations mimicking seed fall in a healthy primary forest) germinated and established without a hitch, most surviving for up to 6 years later according to the latest census.

Amy Rogers Receives Conservation Award

Based on her research in Ecuador, (see page 14) Research Fellow Amy Rogers was recently selected as recipient of the Luis F. Bacardi Advances in Tropical Conservation Award at the 2010 Association for Tropical Biology and Conservation meeting in Bali, Indonesia, attended by 900 leading scientists in her field. (See www.tropicalbio.org. Click on “News,” scroll to “Announcements,” then select “Bacardi Award-2010.”)

She is currently editing three scientific manuscripts on this research and will be submitting them to international, peer-reviewed journals in the near future.
This significant finding may pave the road to highly efficient, low-labor, low-intervention reforestation in the tropics; however, its broad-scale applicability must first be assessed in different forest types and across elevational gradients. Amy’s team is now initiating that process.

One other piece of the puzzle is also under investigation. In 2009, five years after the research plots were established in secondary forest, it was confirmed that although most seedling species were still present, their growth had largely stagnated. This is not surprising, as primary forest seedlings are built to wait patiently for years beneath canopy shade until a light gap opens to allow for their growth. In the Río Canandé watershed, however, our aim is to accelerate the recovery of these degraded areas and add them to the pool of forest available for sustainable management. To that end, Amy and Ecuadorian master’s student Rocio Manobanda recently completed a series of experiments in which different secondary forest strata were removed to determine how to ‘jump start’ continued seedling growth via increased light availability. Although final analyses are still underway, preliminary results suggest that removing dense sub-canopy colonies of *Palicourea* species (or their equivalent) may do the trick. Future monitoring of sapling growth in these plots will be conducted, along with investigations of other liberation techniques in ‘intervened’ or heavily logged forest stands.

The take-home message of this pioneering research is that it may be possible to restore a large percentage of the diversity in young secondary forests by simply intervening in seed dispersal. If found to be generalizable, this strategy will significantly shorten the time required for the human-mediated restoration of diverse rain forest systems—until now, considered an untenable goal by most tropical foresters.

Dovetailing with EcoMadera’s balsa plantation initiative, Amy has also been developing a research protocol to assess the utility of balsa as a nurse crop for mature forest seedling establishment in pioneer vegetation. Prior research indicates that despite successful germination, most seedlings fail to establish in these areas due to desiccation and crowding. Our research indicates that canopy shade is the missing ingredient. Trials will consist of hand-broadcasting primary forest seeds twice monthly beneath mixed balsa and *Inga* (a nitrogen-fixing legume genus) plantations, periodic censusing using trained local inhabitants, and sapling liberation during balsa harvest. If balsa acts analogously to secondary forest, this strategy will accelerate the transition from pioneer vegetation to canopy cover while simultaneously providing a powerful economic incentive for reverting abandoned pastureland to forest.

**Forest Taxonomy and Silviculture:** The native forests in the lower foothills of the western flank of the Andes have extremely high rainfall, from 4 to 7 meters per year, depending on altitude. Isolated from the Amazonian forests by the Andes and restricted to a narrow latitude range by the effects of the Humboldt Current, Ecuador’s coastal rainforests have exceptional levels of endemism (over 20% of plant species exist only in this region). Approximately 90% of the coastal rainforests have already been converted to agriculture, and rapid exploitation is now underway in the Andean and coastal mountain foothill forests.

A key obstacle to conserving these forests is a deficiency of basic ecological knowledge on harvestable species regarding their 1) growth rates; 2) strategies for natural regeneration; and 3) diameter distribution. In 2008, the Pinchot Institute, through its local partner Fundacion Jatun Sacha, hired Nubia Jaramillo and Darwin Rosero, both of whom had extensive experience in native forest management. They installed permanent parcels in both the primary forest and in the degraded and secondary forest. Five local forestry technicians were hired full-time to work
on all aspects of forest research and management.

Three types of parcels were being installed: 1) a control parcel with no harvest, 2) a parcel that will have a light harvest, and 3) another parcel that will receive a more intensive harvest. All trees above 10 cm in diameter were tagged and identified where possible. In smaller subplots, seedlings and saplings were identified to study regeneration success of each species. Samples from the unidentified species were taken to the National Herbarium where skilled botanists compared EcoMadera samples with herbarium specimens to gain a positive genus and species identification. In addition, the forestry crew has started an inventory of the 500 hectares EcoMadera purchased in 2008. This will include a complete census of all trees large enough to harvest, and a sampling inventory of all size classes. This will be basis for EcoMadera’s first forest management plan that will be not only legal, but will be based on long-term sustainable management principles.

Reduced Impact Harvest: In Ecuador, especially in remote regions, the primary method of timber harvest is by chainsaw milling, where, after tree felling, logs are milled into boards with a chainsaw right there in the forest. The boards are then frequently dragged by mules to the nearest river or road for transport to market. This method is wide-spread because it is cheap, portable, and well adapted to the subsistence economy of colonist and indigenous communities. However, it is very inefficient at gaining value from trees, with a net yield in boards of less that 30% of the log. The low yield and the low quality of chain-sawn boards dramatically reduce the value of the forest, and thus contribute to the rational economic decision to convert forests to small-scale agriculture.

In 2008, the Pinchot Institute developed a partnership with the USDA Forest Service to develop a new strategy for timber harvest in the steep and very wet foothill forests. The key objectives were:

- To avoid building roads, since they promote invasions and new colonization
- To significantly raise the yield from each tree when compared with chain saw milling
- To reduce the impact on the residual forest

To increase the profitability of sustainable forest management

In January 2009, Blair Rynerason recruited two local loggers as a team to develop and test innovations for timber extraction and to form the nucleus of a sustainable timber harvest crew. Blair and the extraction team did a brief study of the existing extraction methods using chainsaw milling and extraction by mules. However, pasturage was a problem. In the end, the team found a more effective technology in two Swiss-built chainsaw winches, which can haul large logs up even relatively steep slopes.

Next, the team tested operation of a portable sawmill, which can achieve yields of 60% or more of well-dimensioned wood, ready for secondary processing. Working closely with the Forest Service, they designed a cable extraction method using small-diameter cables that can transport cants and boards from the milling site in the forest to the nearest river or road several kilometers away without the need for new roads or skid trails. The new cable system enabled the crew to gain access to the EcoMadera forestland located five kilometers from a navigable river.
The Andean lowland forest of the Rio Verde Canandé watershed in northern Ecuador is home to three thousand people who have relied largely on timber harvesting and conversion of forest to pastures for their livelihood. This places pressure on the forests and on the diversity of species in the watershed. EcoMadera LLC, in partnership with the Pinchot Institute, has been working to alleviate these pressures on the forest, by addressing its root cause—chronic rural poverty.

Rural poverty has long been a driving force for deforestation worldwide. In the Rio Verde Canandé watershed, the forest serves as a kind of health insurance for its residents. When an individual becomes sick or suffers an accident, the forest resources are often harvested in order to pay for medical care. USAID has also long recognized that the health of the surrounding forests is strongly linked to the health of individuals in rural communities. A community that has no access to health care finds it difficult to break out of the cycle of poverty that keeps individuals from planning long-term for its forest resources. A local primary school teacher reported that students in Cristobal Colon, the largest village in the watershed, miss a significant number of school days due to illness, thus impeding their ability to advance academically. Sickness often prevents employed individuals from going to work. This problematic convergence of factors significantly increases the pressure on forest resources.

In 2007, two young volunteers for EcoMadera, Ariel Pinchot and Julia Przedvorski, recognizing the link between lack of health care facilities and poverty, conducted a comprehensive assessment of both the health conditions within the community and the healthcare resources available to the community. The results revealed a harrowing picture of poor health in...
the region and a great need for trained medical personnel and medical supplies. For example, there is a high prevalence of vector-borne tropical diseases (such as malaria and typhoid fever), water-borne parasitic diseases (due to unsafe water sources and a lack of knowledge about purification methods), high child mortality rates, and malnutrition. Unsafe working conditions result in many injuries, including lacerations and loss of limbs due to machete and chainsaw accidents, as well as poisonings from pesticides used in the nearby palm oil plantations. When sick or injured, families contend with a number of geographical, structural, and economic barriers to obtaining care.

At the time of the assessment, there was no health care facility within the Rio Canandé watershed. The closest one was in La Te, at least 8 miles away. Those seeking medical attention had to travel on dirt roads, usually by bus. For those living on isolated farms or in one of the smaller villages deeper into the watershed, the journey also included as much as a ten-hour hike just to reach the road. Once at a health facility, sick or injured individuals frequently received inadequate care due to staffing shortages and lack of adequate training. Though care was often provided at no cost, supplies such as syringes and gloves had to be purchased by the patient, which presented another financial barrier.

It was apparent from the assessment that the single most effective way to improve the health conditions for the residents of the Rio Verde Canandé watershed would be to establish a health center in the village of Cristobal Colon. Thus, in 2008, EcoMadera and community leaders, in partnership with the Pinchot Institute for Conservation, pledged to establish such a health center. A Community Health Committee was formed, consisting of the Ariel Pinchot and Julia Przedworski, Molly O’Meara, a Peace Corps volunteer in Cristobal Colon, and Pinchot Institute Board members, Robert Hicks George Bohlinger, and John Austin. Since that time, the group has devoted itself to raising money to build a health facility and to bringing medical supplies and personnel to Cristobal Colon.

The Committee developed a three-phase strategy for the establishment of the health center. The first phase was the creation of a safe, efficient, and sanitary facility in which to house the health center. The community of Cristobal Colon designated a previously erected building for this purpose. At the time, it was an unfinished structure, lacking floors, windows, plumbing, and electricity. With financial support from Pinchot Institute Board Members, the Committee was able to purchase materials and hire the services of a skilled contractor to complete the facility. As an in-kind contribution, volunteers from the community provided all of the unskilled labor. The health center facility was completed in the fall of 2009, meeting the standards set forth by the Ecuadorian Ministry of Health.

The second phase was to secure medical staff for the health center. At the initiation of this phase, there were no healthcare professionals in the entire watershed. To address this shortage, the health committee and EcoMadera negotiated with the Ecuadorian Ministry of Health, and with financial support from donors in the United States, the community of Cristobal Colon was able to send one of its residents to receive training as a primary care nurse. More recently, the Ministry of Health has pledged to assign a part-time medical resident to provide basic primary care services such as prevention, diagnosis, and treatment to the community. Thus, through government sources and with outside support, the health center will be permanently staffed with trained medical professionals.

The project is currently nearing completion of the third phase: furnishing and equipping the health center. With support from Goodwill of Virginia and the Rotary Club, in-kind donations of medical equipment and furniture have been collected from medical centers throughout the United States. A 20-foot container is currently being readied for shipment to Ecuador. Once the container has arrived in Cristobal Colon, this final phase of the project will be completed and the health center can begin providing primary care services to the over 3,000 residents in the Rio Verde Canandé watershed.

Health is a basic human right and a goal onto itself. However good health is also vital from a systemic perspective, without which poverty alleviation and natural resource conservation cannot occur. Healthy families and healthy forests are intimately connected, and one cannot hope to achieve either without addressing poor health conditions and the degradation of natural resources concurrently.

Ariel Pinchot and Julia Przedworski work in collaboration with EcoMadera, the Pinchot Institute for Conservation, and the community leaders of the Rio Verde Canande watershed. In addition to conducting the initial research on the health status and needs of the community, they continue to manage the planning, development and implementation of the health improvement initiative.
Improving Conventional Timber Harvest and Log Yield in Working Forests of the Mountainous Tropics

Blair S. Rynearson
Research Fellow

Encompassing roughly 50,000 hectares, the Rio Canandé watershed is one of the last unprotected and relatively intact areas of Ecuador’s Chocó wet forest. Despite longstanding recommendations by foresters for basic improvements of logging methods in the tropics, poor practices are still the norm. Common problems include lack of planning, poor felling, that often results in damaged stems and collateral damage to the remaining stand, wasted timber through selection of only the prime logs, poor skidding practices and unsustainable harvest intensities. Most small-scale timber harvest in the tropical forests of Ecuador involves little more than chainsaws and draft animals. It is largely unregulated, targets a limited number of merchantable species, and is often practiced in conjunction with land conversion. Milling of logs via free hand chain sawing is low yield (25%–35%), and labor spent in extraction via mules is restricted by the distance from rivers, thus concentrating timber harvest to a zone within 2 to 4 kilometers from the river valleys.

Our research focuses on measuring the expected increase on efficiency and yield with the implementation of the following basic technologies and improved practices: a) a cable system allowing efficient transport of equipment and timber, b) training local technicians in reduced impact logging techniques (RIL), c) the transport of a portable sawmill to the harvest site for increased log yield, and d) wood property testing on species that are currently non-merchantable. Successful implementation of these practices could raise the value of forestland, making it competitive with various forms of land conversion, such as cattle grazing, palm oil, and cacao plantations.

Preliminary analysis suggests that the Peterson portable sawmill has increased log yield to 50%–60%, and drastically reduced flaws in dimensioned lumber. Bunching of logs sawn-to-length to landings, via heavy-duty, Swiss made chainsaw winches appear to have reduced time otherwise spent transporting the saw and milled lumber.

Studies suggest that although adoption of RIL techniques requires an increase in time dedicated to planning, the benefits of reduced damage to timber, decrease in road and skid trail density, and full recovery of felled timber make it economically competitive with conventional logging. Maintenance of forest structure, composition, and function, in addition to reduction in mortality and damage to the remaining stand are of concern for biodiversity and future harvest.

Implications for EcoMadera

We are in the process of sending a container of lumber to a Pennsylvania-based contractor who will include many of our lesser-known species that will be tested, utilized and marketed. Company-owned land would be divided between harvest (60%) and reserve (40%) areas, and in those areas designated for harvest, growth data indicates the suggested removal of 20 m³, per 20-year cycle, is in line with sustained timber yield.

EcoMadera hopes to use revenue generated through polycyclic, sustainable forestry to purchase additional land and to provide employment to the local population, which is currently engaged in illegal logging and land clearing.

We have received support from the USDA Forest Service and hosted a course on cable logging and RIL instructed by Professor Bob Rummer of the Southern Research Station, and Jim Sherar, a retired engineer. In addition to our own staff, local residents, foresters operating out of the Amazon and a forester working in the Chachi indigenous reserve attended the course. The material covered was basic (cable splicing, safe working
loads, guying, etc.) but seemed revolutionary, as the majority of participants possessed only a crude knowledge of logging. Rummer and Sherar have stayed on as consultants and continue to assist with new ideas, donated equipment and technical advice. EcoMadera has stayed in touch with course participants and continues to disseminate our findings.

Our aim is to achieve minimal change to species composition, using detailed inventories and management plans as performed by our forestry staff. Continued monitoring of permanent plots will document effects of differing logging treatments on growth and biodiversity. Results from our research will ensure that appropriate technology will be selected to balance productivity with sustainable forest management.

### Expanding EcoMadera’s Scope

In Ecuador, Pinchot Institute Research Fellow Dr. Amy Rogers has been hired to expand EcoMadera’s geographic and programmatic reach. Amy is spearheading an integrated conservation management strategy within Mache-Chindul Ecological Reserve, with habitat restoration at its core. These efforts intentionally dovetail with those of the Institute’s EcoMadera project at the outskirts of sister reserve, Cotacachi-Cayapas. Together, the two programs are contributing to our development of a well-rounded ‘tool box’ of tangible solutions to tropical forest conservation both within and outside of protected areas. Inclusion of Mache-Chindul has helped to define the Institute’s niche in Ecuador: 1) geographically, by establishing a presence in both of the country’s last substantive tracts of standing Chocó rain forest and 2) contextually, by bolstering our ability to address reforestation and the integrity of large-scale ecological processes in addition to deforestation and socioeconomic concerns.

### Bay Bank Marketplace Launched

The Pinchot Institute for Conservation, Sustainable Solutions, LLC and many supporting partners have developed and launched the Bay Bank Marketplace — the Chesapeake’s conservation marketplace! Featured in The Pinchot Letter, Winter 2010, this online resource provides basic ecosystem market information to buyers and sellers and provides a marketplace for buyers to find credits.

For more information, go to www.thebaybank.org.
Techniques to facilitate the recovery, of old-growth tropical rain forests have been widely theorized but are rarely tested through on-the-ground scientific investigation, due in large part to the logistical challenges of such an undertaking in these complex ecosystems. How ecological processes shape the countless different pathways of species composition observed in recovering forests is critical to reforestation design, as it forms the basis for countering obstacles to the restoration of diversity. In a first attempt at addressing this challenge, we tested the independent and combined effects of: a) distance to old-growth forest, b) availability of old-growth seeds, c) competition with secondary forest understory plants, and d) accessibility by seed predators on resultant patterns of old-growth seedling establishment in a 15 year-old secondary forest of the Ecuadorian Chocó.

Our results revealed remarkably clear patterns that have now held constant for six years of seedling censuses. Constraints to old-growth seedling establishment arose almost exclusively at the seed stage either via failure to disperse or predation by rodents, while competition with other understory plants and distance to old-growth forest did not play limiting roles. The benefits of adding seeds outweighed the constraints imposed by seed predation, and led to marked increases in the number of old-growth seedlings and old-growth species. These findings suggest that secondary forests may house a tremendous number of unoccupied seedling ‘niches,’ and that the majority of old-growth forest species are well adapted to fill them provided that they arrive.

Why Secondary Forests?

Along the pathway of tropical forest succession, secondary forest is by far the lengthiest stage. While pre-canopy ‘pioneer vegetation’ is shaded out by a young forest canopy in as little as five to ten years, secondary forest can be comprised by several distinct phases, each of which takes from 30–70 years to turn over. If there is a phase of tropical forest recovery that needs accelerating, this is it. Furthermore, secondary forests now represent a rapidly escalating proportion of tropical deforested lands due to current urbanization trends. Recent estimates indicate that for every 6–7 hectares of old-growth forest cut in the tropics, one hectare reverts back to secondary forest via succession. Nonetheless, our knowledge of secondary forest regeneration ecology remains in its infancy.

Why reforestation?

Deforestation is only part of the equation in today’s rapid loss of tropical forests. Isolated forest tracts undergo a self-perpetuating cycle of ecosystem decay that continues long after the last chain-saw has been set down. Caused by ‘edge effects’ that lead to habitat degradation from the outside-in, size-related reductions in gene pool diversity, and inadequate habitat for top predators, this cycle poses an equal and perhaps more complex threat to forest preservation than deforestation itself. Tropical ecologists now agree that there are only two measures capable of reversing this trend: the rejoining of isolated forest tracts via wildlife corridors and the creation of ‘buffer’ zones at forest perimeters. Both of these measures are fundamentally dependent upon the reconstruction of functioning forest habitat through reforestation.
The Pinchot Institute’s Mache-Chindul Program

Our research focuses on the processes inherent to secondary forest succession that limit widespread recruitment of old-growth forest species. The fundamental goal of this research is to facilitate the development of ecologically-based reforestation practices that directly counteract obstacles to forest succession (i.e. ‘assisted natural regeneration’), accelerating the establishment of old-growth forest. Investigations are based in the 119,000-hectare Mache-Chindul Ecological Reserve, one of two remaining expanses of Ecuador’s Chocó rain forest—an internationally recognized conservation priority due to extraordinary levels of both endemism and deforestation pressure. These findings are providing preliminary indicators of successional potential and trajectory in the region’s secondary forests, along with the first baseline ecological data for reforestation practices specific to the Chocó. We are currently focused on three specific lines of research: 1) in secondary forest, jump-starting the continued growth of established old-growth seedlings by manipulating available light levels in different forest strata, 2) in pioneer vegetation, finalizing a strategy that employs balsa as both an economic engine for reforestation and a means to accelerating canopy closure, 3) in ‘altered’ or heavily logged forest, conducting inventories of seedling and sapling communities to assess the need for intervention and develop appropriate methodologies. An additional, upcoming component of our work within the reserve will be purely socioeconomic in nature, focused on facilitating the development of community-run cacao cooperatives as a sustainable alternative to deforestation.

Clearing to light forest-floor seedlings.

Inside the Institute

Leigh Lindstrom Joins Pinchot as Communications Coordinator

Leigh Lindstrom recently joined the staff of the Pinchot Institute as the Communications Coordinator. Leigh plays the lead role in providing information about Pinchot Institute programs to a variety of audiences, through both print and electronic media. She also serves as the key contact for Pinchot Associates, and other donors and contributors to Pinchot Institute Programs. Leigh has expanded the social media outlets for the Institute, and keeps the friends and supporters of PIC updated on Facebook and LinkedIn. She has a Masters degree in Environmental Law and Policy from Vermont Law School, and received her B.A. in Social Ecology from the University of California, Irvine, where she was a Regent’s Scholar. Prior to coming to the Pinchot Institute for Conservation, Leigh worked in environmental education and outreach for the Catalina Island Conservancy, the Irvine Ranch Conservancy, and the Sea and Sage Audubon Society.
The Pinchot Institute will soon mark the 50th anniversary of its dedication by President John F. Kennedy at Grey Towers National Historic Site—a half-century of carrying forward Gifford Pinchot’s philosophy of conservation through sustainable use; serving the public interest through objective research on critical natural resource conservation issues; and discovering collaborative solutions through facilitating rational civil dialogue on key issues. Your support through a contribution to the Pinchot Legacy Fund will help ensure that in the next half-century the Pinchot Institute will continue to provide conservation research and collaborative problem-solving to educate and inform the next generation. Help us build on a half-century of leadership in conservation thought, policy, and action.

“The conservation of natural resources is the basis, and the only permanent basis, of national success. There are other conditions, but this one lies at the foundation.”  
— Gifford Pinchot

If you would like to consider making a Legacy gift, and be recognized as a 50th anniversary donor, please return the enclosed card. For more information, please contact Leigh Lindstrom at 202.797.6582 or lindstrom@pinchot.org, or visit www.pinchot.org.